

The background of the slide is a deep space scene. In the upper left, a large, detailed Earth is visible, showing blue oceans and white clouds. To the right and in the lower half, there are several vibrant nebulae in shades of purple, blue, and yellow. In the lower right foreground, four sleek, blue and orange spacecraft are arranged in a cluster, pointing towards the upper right. The entire scene is set against a black background filled with numerous small white stars.

# ***Technology Roadmap Overview***

***Diep Nguyen***



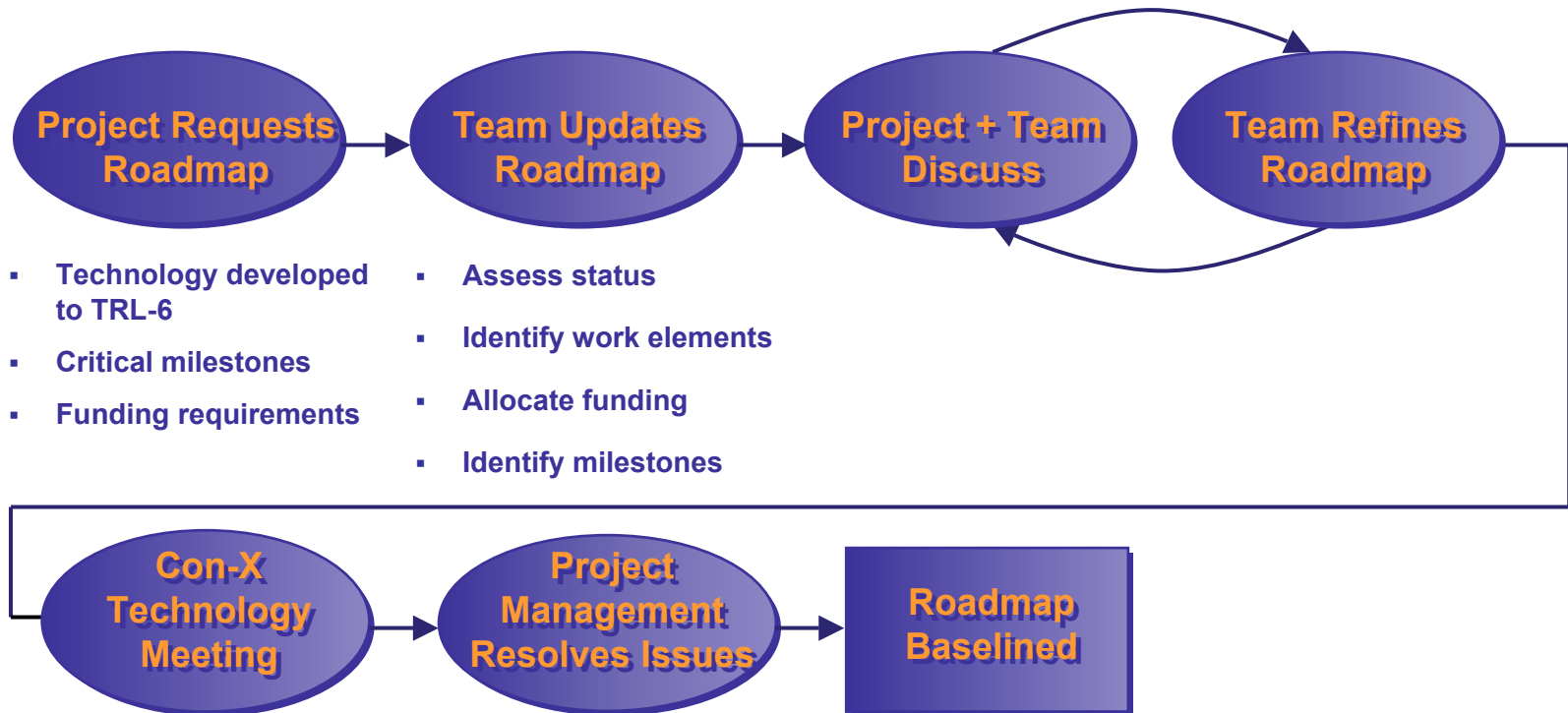
# Instrument Technology Roadmap Development

---

- **Development Process**
- **Overview of Roadmaps**

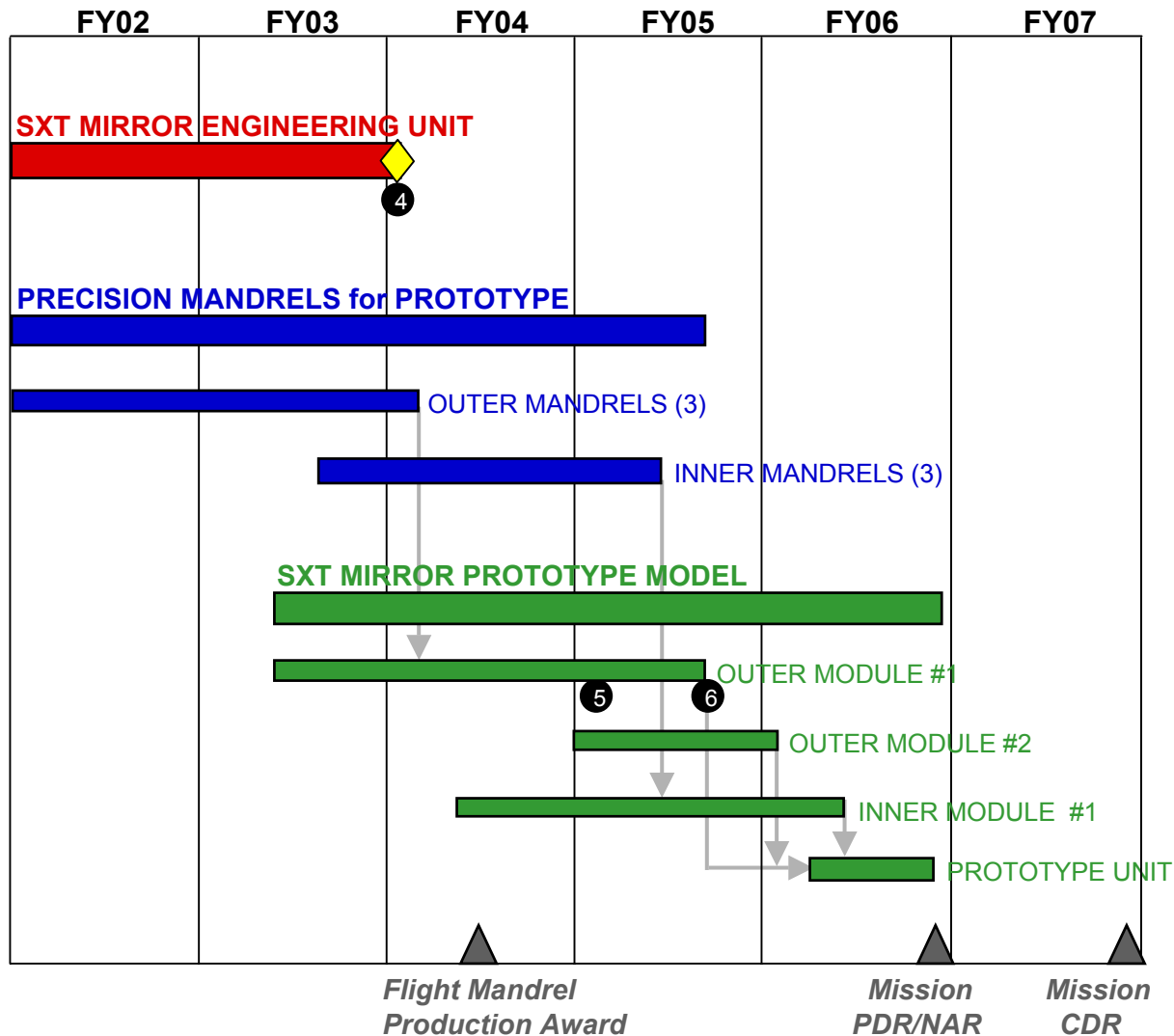


# Roadmap Development Process





# SXT Optic Technology Roadmap



Critical Technology Milestone



# Technology Readiness Level (TRL)



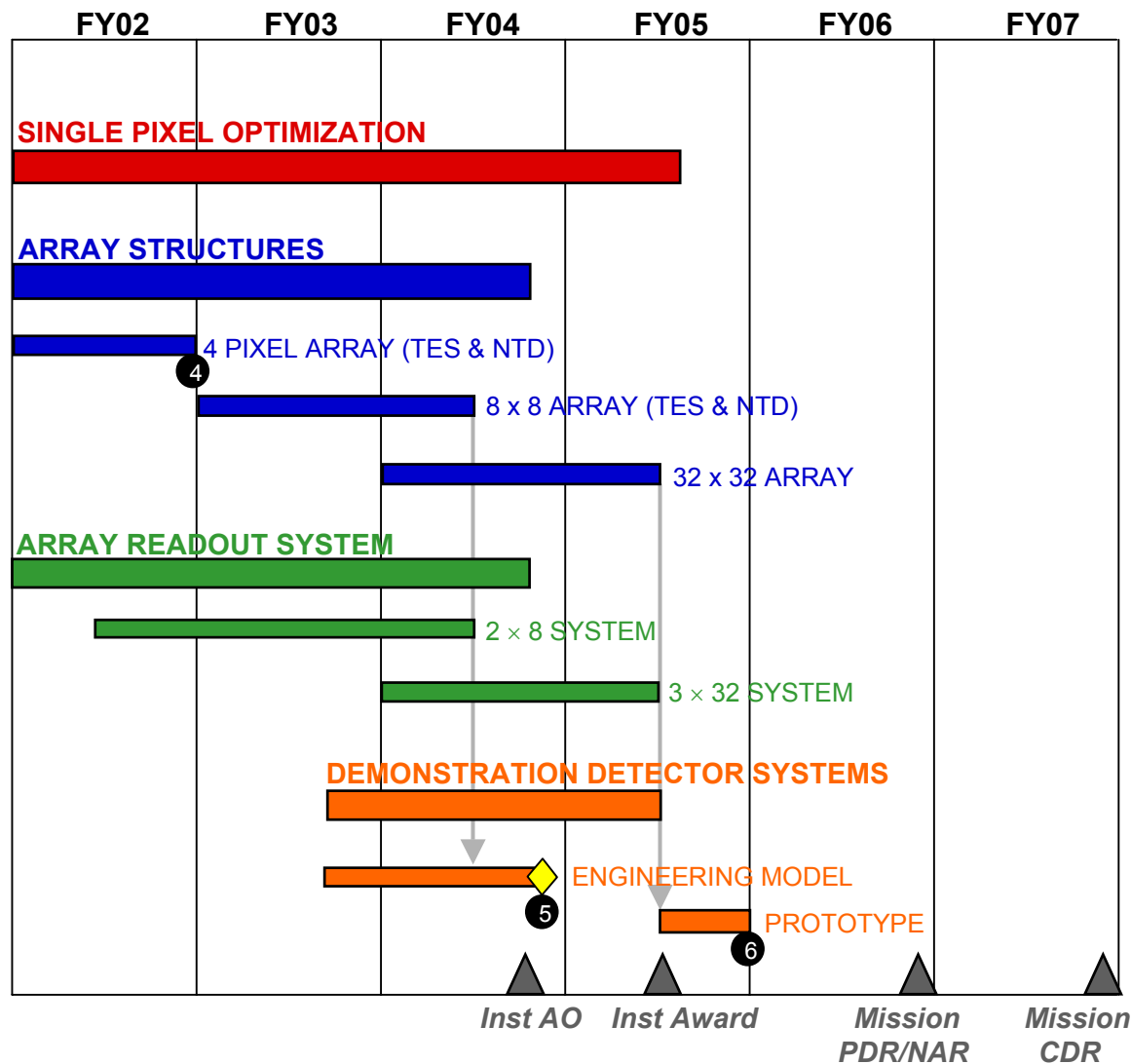
## **SXT Optic Critical Technology Milestone**

---

- ◆ SXT Optic Engineering Unit Completed and Tested in X-rays**
  - Alignment comb fabrication process verified**
  - Assembly and alignment procedures established**
  - Optical performance understood and extendable to 10 arc sec**
  - Replication process satisfies requirements and is reproducible**
  - Reflector support concept verified**
  - Preliminary mechanical testing satisfactorily completed**



# X-ray Calorimeter Technology Roadmap



Critical Technology Milestone



Technology Readiness Level (TRL)



## **X-ray Calorimeter Critical Technology Milestone**

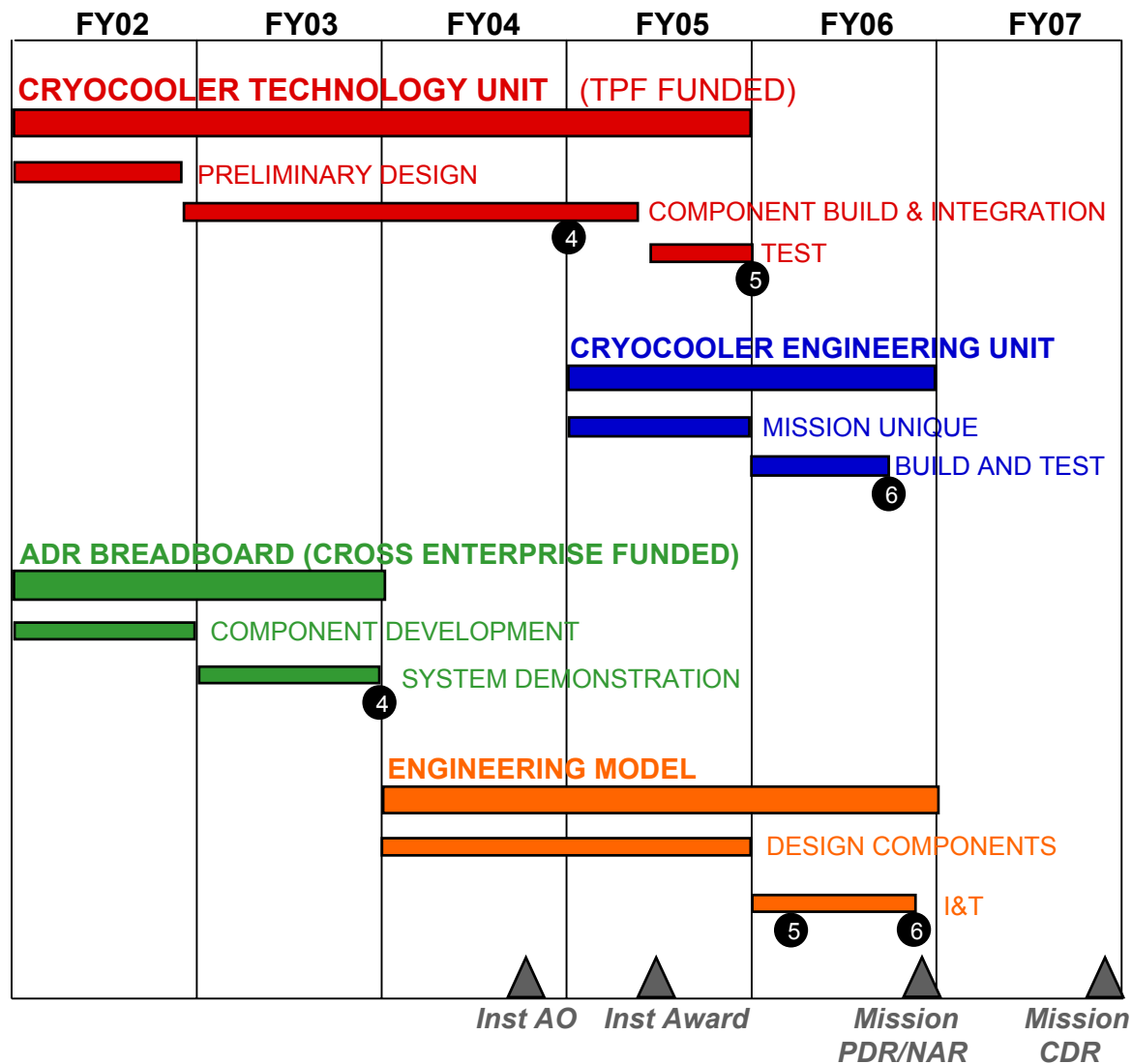
---

### **◆ Small X-ray Calorimeter Array Fabricated and Tested**

- Pixel scale and quantum efficiency appropriate to Constellation-X baseline requirements
- Energy resolution of 2 eV at 1.5 keV and 4 eV or better at 6 keV, simultaneously in each pixel



# Cryocooler and ADR Technology Roadmap



Critical Technology Milestone

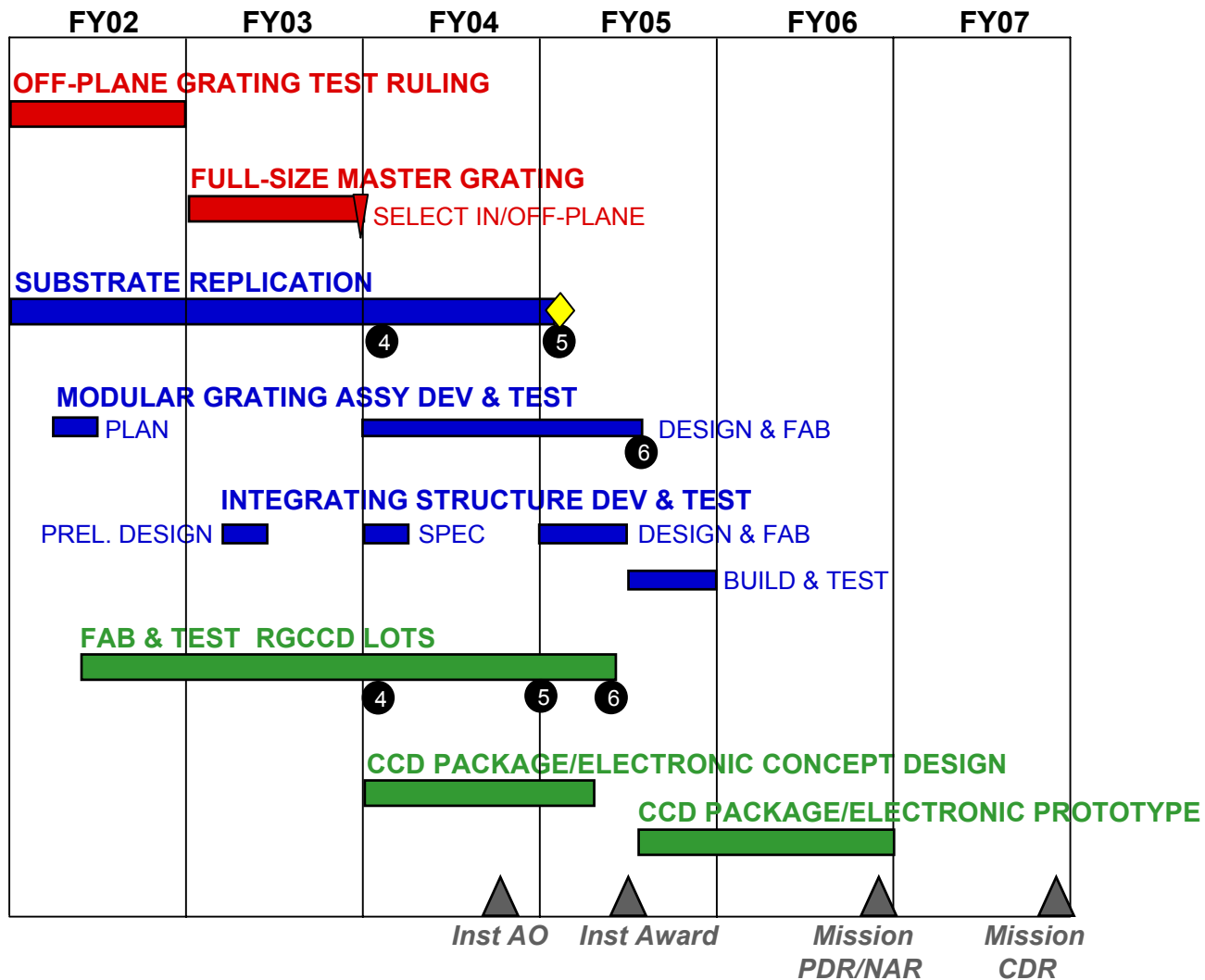


Technology Readiness Level (TRL)





# Grating/CCD Technology Roadmap



Critical Technology Milestone



Technology Readiness Level (TRL)



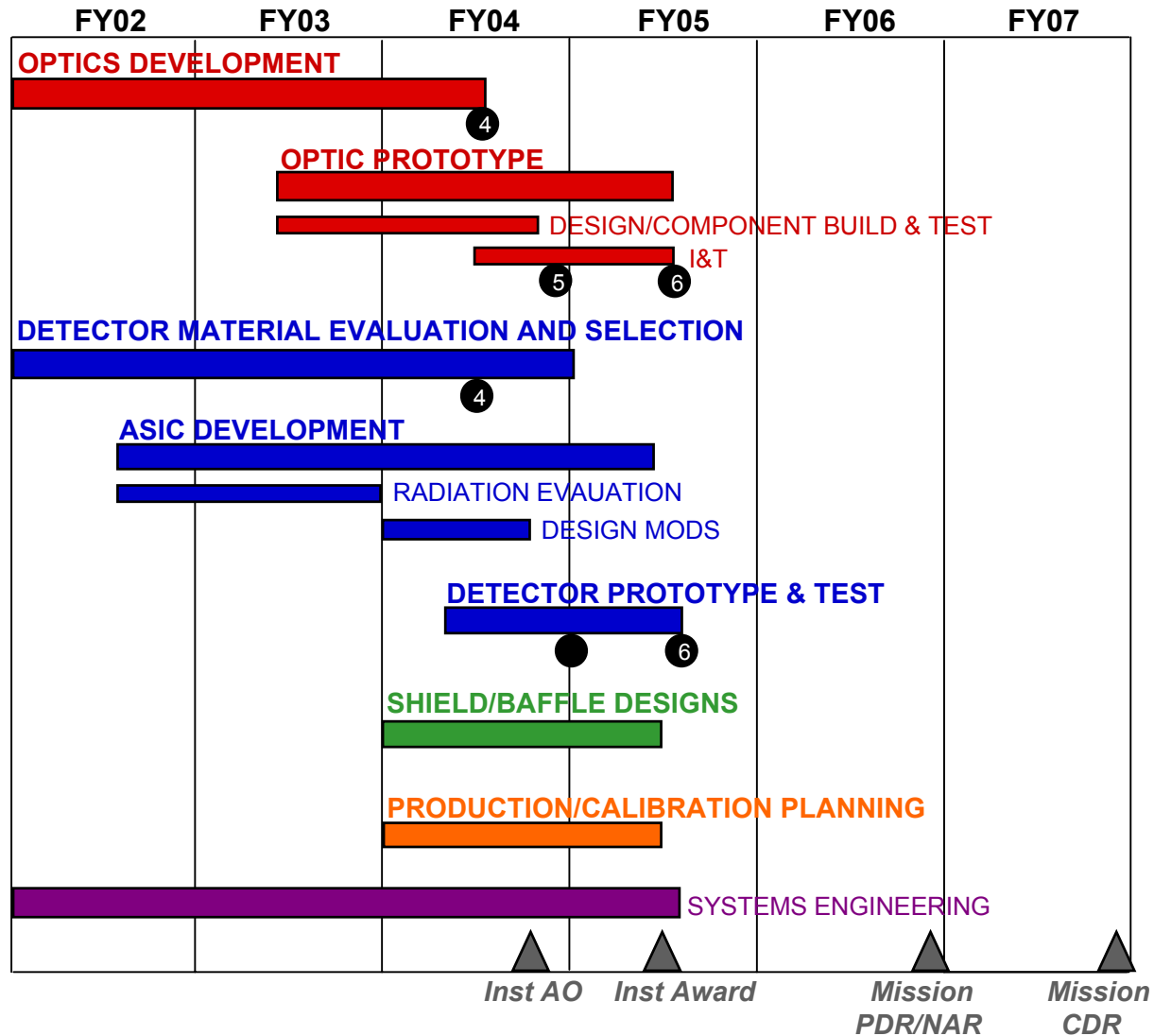
## Grating Critical Technology Milestone

### ◆ Assembly of Three Flight Representative Lightweight Grating Substrates

- Substrates fabricated use procedures that can be applied to mass production and experience all processing steps that are included in the plan for the final flight gratings
- Substrate mass per unit area  $\leq 0.2 \text{ gm/cm}^2$
- Substrate as-assembled flatness  $\leq 2$  arc-seconds in the dispersion direction
- Substrate mutual alignment  $\leq 2$  arc-seconds in the dispersion direction



# HXT Technology Roadmap



Critical Technology Milestone



Technology Readiness Level (TRL)



## HXT Critical Technology Milestone

- ◆ **Hard X-ray Multilayer Mirror Prototype Completed and Tested in X-rays**
  - Angular resolution  $\leq 1$  arc minute (Half Power) Diameter at 20 keV
  - Mass and reflectance consistent with the baseline mission requirements
  - Multilayer mirror fabrication process verified



## Summary

---

- Road map development was an integrated team effort for both the project and the instrument teams.
- Road maps provide a strong foundation for Con-X to achieve the critical milestones and to develop the technologies to TRL-6 stage.
- Plans will be documented in the next version of the Con-X Technology Development Road Map (to be released early next year).